

NON-PUBLIC?: N  
ACCESSION #: 9309090435  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Millstone Nuclear Power Station Unit 3 PAGE: 1 OF 4

DOCKET NUMBER: 05000423

TITLE: Reactor Trip Due to Electro-Hydraulic Control Power  
Supply Failure  
EVENT DATE: 03/31/93 LER #: 93-004-01 REPORT DATE: 08/31/93

OTHER FACILITIES INVOLVED: DOCKET NO: 0500

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: Jeffrey S. Young, Engineer, 6442 TELEPHONE: (203) 447-1791

COMPONENT FAILURE DESCRIPTION:  
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:  
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

#### ABSTRACT:

At 0103 on March 31, 1993, with the plant in Mode 1 at 100% power, a turbine valve closure resulted in a reactor trip followed by a turbine trip.

Turbine valve closure was the result of a faulty power supply in the Electro-Hydraulic Control (EHC) system. With the exception of a steam generator code safety valve not completely reseating, the plant responded normally to the transient.

Extensive trouble shooting determined that a power supply in the EHC system was faulty and caused the turbine valves to close. The faulty power supply was replaced. As action to prevent recurrence, the power supplies in the EHC system will be replaced or refurbished on a 10 year period.

Subsequent investigation determined that the steam generator safety valve which did not completely reseal had an incorrect lower adjustment ring setting. Additional inspection revealed that 7 other safety valves also had incorrect settings. Three of these valves indicated that they lifted and reseated during the transient. The other four valves did not open.

The root cause of the improper settings was inadequate work control by the vendor. Crosby Valve and Gage Company, who performed maintenance on the safeties, conducted an investigation and determined that their personnel inadvertently used the wrong procedure to set the lower adjustment rings.

END OF ABSTRACT

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## I. Description of Event

On March 31, 1993 at 0103 with the plant in Mode 1 at 100% power (586 degrees Fahrenheit and 2250 psia) a turbine load rejection alarm was received as the turbine control valves began to close. A normal response to turbine valve closure occurred. This consisted of all steam dumps opening, atmospheric dumps on 3 steam generators opening, and 1 Pressurizer Power Operated Relief Valve (PORV) cycling open for 6 seconds. In addition, indication was received that several code safety valves on 2 steam generators lifted. 19 seconds after the turbine valves began to close, steam generator levels shrank to the low low setpoint which resulted in a reactor trip followed by a turbine trip. After the reactor and turbine trip, the atmospheric dumps on the fourth steam generator opened and indication was received that code safeties on a third steam generator lifted. As steam pressure decreased, all dumps and safeties reseated with the exception of 1 safety on the "D" steam generator.

At the time of the trip, operators verified that the Reactor Trip and Bypass Breakers were open, that all control rods were fully inserted, and that neutron flux was decreasing. An automatic start of the Auxiliary Feedwater System occurred due to the low low water level in one steam generator and the turbine driven Auxiliary Feedwater Pump started on low low water level in two steam generators. A Feedwater Isolation occurred due to the low average Reactor Coolant System temperature (564 degrees Fahrenheit) coincident with the reactor trip. Subsequently, the plant stabilized at the no load temperature of 557 degrees Fahrenheit. These were expected system responses. No additional Engineered Safety Feature (ESF) actuations were required or initiated.

After the plant had stabilized, the safety was gagged but still did not close completely. A normal plant cooldown was performed and the safety reseated at approximately 1000 psig steam generator pressure.

Subsequent investigation revealed that the lower adjustment ring of the malfunctioning safety valve was incorrect. When set properly, the lower ring insures a clean, forceful popping action when the safety lifts and a cushioned reseating when the safety closes. If this ring is set too high, steam cannot escape as rapidly when the valve begins to close. As a result the blowdown is increased. The settings of the lower adjustment rings on 11 other safeties which had been worked on by Crosby Valve were checked. All 7 of the valves which were installed were found to be set improperly. Of these, 3 indicated that they had lifted and reseated during the transient and 4 did not open because their setpoints were not reached.

## II. Cause of Event

The root cause of the turbine valve closure was equipment failure. A capacitor failure in one of the EHC power supplies caused noise to EHC solenoids resulting in a slow closure of all turbine valves with servos.

The root cause of the safety valve failing to completely reseat was inadequate work control by the vendor. When the contractor performed maintenance on 4 safeties in 1987 and 1988, NNECO Quality Control performed an inspection of the work on 2 that required ring adjustment. No discrepancies were noted and the ring settings of these safeties were correct. Work on another group of 8 safeties was performed between 1989 and 1991. During this period, the ring settings were documented and a certification statement was issued. Investigation by the vendor after the event revealed that a procedure for Crosby safety valves was inadvertently used in setting the lower adjustment ring instead of the procedure specified by Northeast Utilities. Northeast Utilities performed a surveillance of Crosby and found no discrepancies. An industry audit team who had previously scheduled an audit of Crosby's Appendix B program was informed of this event and the results of the surveillance. This audit team had no significant findings and reported only a minor order entry discrepancy.

## III. Analysis of Event

This event is being reported in accordance with 10CFR50.73(a)(2)(iv) as any event or condition that resulted in automatic actuation of an ESF including the Reactor Protection System. An immediate notification was made in accordance with 10CFR50.72(b)(2)(ii).

All safety systems functioned as designed as a result of the reactor trip. The Auxiliary Feedwater System started automatically due to the low low steam generator water level. A Feedwater Isolation occurred due to the low Reactor Coolant System average temperature coincident with the reactor trip. No other ESF signals were initiated and the event posed no significant hazard to the health and safety of the public. Secondary plant equipment was returned to normal operation, and the unit was returned to power.

The improper setting of the lower adjustment rings on the safety valves did not place the plant out side of the design basis for a stuck open safety valve. The plant is analyzed for a flow of 977,200 lbm/hr for this accident. Each safety valve is designed to pass 5% (970,000 lbm/hr) of total steam now. However, parameter indications showed that the affected safety valve had not completely reseated but was not stuck fully open. The partially open safety did not result in an uncontrolled cooldown and the plant operators were able to maintain normal shutdown plant temperature and pressure. Indicated proper operation of 3 other safeties which had improper ring adjustment during the transient showed that improper setting of the lower adjustment ring does not necessarily mean that a safety will not reseal. While actual operation and subsequent testing of the malfunctioning safety (see below) showed that it reseated at lower pressures, these pressures are normally reached several hours after plant shutdown. Therefore, any other valve which did not fully reseal would eventually close by itself.

Wyle Valve Reseated Reseat Pressure  
Test No. During Test (PSIG)

1 No < 1055

2 Yes 1068

3 Yes 1062

4 No < 1065

Therefore, the 4 valves that did not open may have reseated properly if they had opened. In addition, they would not have stuck fully open

if they had failed to reseal and would have closed completely by themselves after a controlled plant cooldown to approximately 530 degrees Fahrenheit.

Because there is no measurable primary to secondary leakage in the "D" steam generator, there was no release of radioactive material as a result of the partially open safety valve.

A review of the impact of an extended blowdown of a main steam safety valve on other postulated accidents has been completed. This review concluded that the consequences of a main steam safety failing to reseal properly are bounded by the assumptions and results of the accident analysis for Unit 3. This completes review of this event as a 10CFR21 concern.

#### IV. Corrective Action

As immediate corrective action for the trip, the faulty power supply was replaced. As action to prevent recurrence, the power supply will be replaced or refurbished on a 10 year period. Due to replacement unavailability, the other power supplies in the EHC system will be replaced during the upcoming refueling outage.

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As immediate corrective action for the improper ring settings, the 11 other safety valves which had been refurbished, repaired or set by Crosby Valve were examined for proper ring settings. The 7 (excluding the malfunctioning one) which were improperly set were adjusted as necessary to their proper ring settings. All spare safeties currently out for maintenance at any contractor will be verified before return to the site.

#### V. Additional Information

No other Licensee Event Reports (LERs) have been submitted for reactor trips resulting from a failed power supply in the EHC system.

This LER also satisfies NNECO's evaluation, notification and reporting obligation to report defects under 10CFR21. In addition, a copy of this LER was sent to the contractor that performed maintenance on the main steam safeties.

No similar power supply malfunctions were found in a review of NPRDS.

EIIS codes

Systems Component

Main Turbine Control Power Supply, Electric - JX  
Fluid System - TG

Main/Reheat Steam Relief Valve - RV  
System - SB

ATTACHMENT 1 TO 9309090435 PAGE 1 OF 1

NORTHEAST UTILITIES

NU The Connecticut Light And Power Company  
Western Massachusetts Electric Company  
Holyoke Water Power Company  
Northeast Utilities Service Company  
Northeast Nuclear Energy Company

General Offices o Selden Street, Berlin Connecticut

P.O. BOX 270  
HARTFORD, CONNECTICUT 06141-0270  
(203) 665-5000  
August 31, 1993  
MP-93-687

Re: 10CFR50.73(a)(2)(iv)

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555

Reference: Facility Operating License No. NPF-49  
Docket No. 50-423  
Licensee Event Report 93-004-01

Gentlemen:

This letter forwards Licensee Event Report 93-004-01 which is being submitted to report on root cause and revise the analysis of event. Licensee Event Report 93-004-00 was submitted pursuant to 10CFR50.73(a)(2)(iv), any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS).

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

Stephen E. Scace  
Vice President - Millstone Station

SES/JSY:ljs

Attachment: LER 93-004-01

cc: T. T. Martin, Region I Administrator  
P. D. Swetland, Senior Resident Inspector, Millstone Unit Nos. 1, 2  
and 3  
V. L. Rooney, NRC Project Manager, Millstone Unit No. 3

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